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POPULAR MECHANICS

An Illustrated Weekly Review of the Mechanical Press of the World

"Tells you how to do things." "Written so you can understand it."

Vol. 2. No. 10. CHICAGO, SEPTEMBER 13, 1902. PRICE 5 CENTS.

Hauling Giant Logs in California

Powerful Steam Logger that Plows Through the Woods in the Land Where the Big Trees Grow

IN THIS ISSUE:

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Combined Elevator and Transfer Wagon.
Wreck of the World's Largest Locomotive.
Summer Course in Easy Mechanics—Building a Camp.

Popular Mechanics can be bought of any newsdealer in the United States.

TRACTION ENGINE HAULS LOGS.

More Reliable Than Horses and Pulls Heavier Loads.

On the front page is an interesting illustration, taken for Popular Mechanics in the Redwood lumbering district in California. The traction engine is descending a 17 per cent grade, hauling two trucks loaded with fifteen immense logs, each 20 feet long and 3 feet in diameter. The top of the load is fully 20 feet above the ground. These two trucks contain 50,000 feet of lumber weighing over 100 tons. The trucks are built in the woods, the wheels being sections sawed from the ends of perfect logs and with a steel tire fastened on.

The train travels over the roads without the help of rails or planks on which to run. The engine was built by the Holt Company at Stockton, and has the remarkable faculty of turning completely around in a space of only 25 feet square. The engine and five empty cars can be turned in a space of 50 feet square. Traction engines are much preferred by loggers to horses or mules. The engines never get weary, and can be controlled with perfect accuracy where a gang of teams would become frightened and run away.

THERMITE MAKES THE HOTTEST KNOWN HEAT.

New Substance Produces a Blaze in Comparison to Which Mount Pelee Would Seem Like a Refrigerating Plant.

The boiling mouth of Mount Pelee in the midst of its eruption when its fiery blast destroyed St. Pierre in a moment, would have been like a cold storage vault in comparison to the heat that is produced through a newly discovered compound—thermite. Only the touch of a match, it is claimed, is necessary to produce a heat of 5,400 degrees Fahrenheit. Heat produced by all other sources appear like icebergs in comparison. Under its awful lightning blaze granite flows like water and big steel rails are welded in the twinkling of an eye. It can be made to explode with tremendous power or to work almost silently with appalling result.

Thermite is a mixture of aluminum and oxide of iron. It is the discovery of Dr. Hans Goldschmidt. Its remarkable powers were recently demonstrated before the Columbia University Chemical society. The discovery was made in an effort to produce pure metallic chromium, the metal much employed to give extra hardness to steel. This metal is not usually pure and contains a considerable quantity of carbon. It had been known that when a mixture of aluminum filings and the oxide of chromium were heated in a furnace a violent explosion would follow owing to the intensity of the chemical action. Dr. Goldschmidt argued that in such cases metalic chromium must be found.

After a series of experiments the problem was solved. When the aluminum filings were thoroughly mixed in a crucible with oxide of chromium a teaspoonful of ordinary flashlight powder and peroxide of sodium was placed on the mass. This acted as a "primer." A match was applied. There was a bright flash followed by a glow and gentle flame. When cold the crucible was broken and at the bottom was found metalic chromium at least 90 per cent pure. Above it and easily separated was a slag of aluminum oxide, or artificial corundum. Dr. Goldschmidt soon discovered that manganese could be equally well obtained in this way—merely substituting oxide of manganese for oxide of chromium. Next the chemist substituted oxide of iron for oxide of chromium and when touched off by the flashlight primer the slag of the corundum spurted out liquid and flaming. It was a blinding spectacle. Bubbling like water it ran pure metalic iron and sank to the bottom in a dazzling molten mass, so intensely brilliant that the chemist was temporarily blinded. Though the contents of the crucible flowed out at a temperature of 5,400 degrees Farenheit, the outside of the crucible could be held in the bare hand almost immediately because the development of the heat was too rapid to affect surrounding bodies unless kept in contact with the molten mass longer than it remains in the crucible.

Thus thermite was discovered. Steel rails are welded by this process in Berlin, Munich, Hamburg, Casse and other German cities. It is also a success in welding pipes into continuous lengths, miles long if necessary. For pipes only, the lag (not the molten metal) is allowed in contact with the pipe joint.

GREAT NILE DAM IS EGYPT'S RESURRECTION.

Desert Land Will Be Reclaimed By the Most Remarkable Engineering Feat Ever Attempted.

The announcement that the last coping stone of the great Nile river dam at Assuan has been laid and that the great reservoir will be ready by the end of the year means that 2,500 square miles of Egyptian desert will soon be covered with rich soil which, when under cultivation, will have a value of $400,000,000. The dam is regarded as the salvation of Egypt. It is viewed as the greatest engineering feat ever attempted. It cost $25,000,000; it is to be paid for by the Egyptian government in installments to run 30 years. Sir John Aird, an Englishman, is the contractor. Work was begun 2½ years ago, and 25,000 men have been employed. The dam is a mile and a quarter long and its top makes a broad viaduct for camel caravans. There are 180 sluices for releasing the water. The traffic on the river is provided for by a chain of locks at the western extremity. The dam will hold back and spread over thousands of miles of desert 1,000,000 tons of sediment laden waters of the Nile.

ELECTRIC PLANT RUNS ALL NIGHT WITH CORPSE IN CHARGE.

Eugene C. Ketcham, night electrician at the water power plant of the Missoula Light and Power Company at Bonner, Mont., was killed while oiling the engine. The machinery continued to run with only the dead electrician in charge until the day men came to work the next morning. The body had evidently been dead since before midnight. That this plant should have continued to run all night by itself without the slightest mishap is another evidence of the almost human-like state of perfection that is being attained by modern machinery.

QUEER LAUNDRIES IN JAVA AND MANILA.

Frank G. Carpenter in a graphic description of the methods of laundrying in foreign lands, written for the Laundry Journal, has this to say in telling of a unique laundry on a canal at Batavia, the capitol of Java: "The washing is done without tub or washboard in the water of that half muddy stream. The canal is walled with bricks, and at every few yards there are steps leading from the street down into it. Each pair of steps is filled with brown-shouldered, brown-skinned maidens, who stand up to their waists in the water, pounding the wet clothes on the stones, rubbing them with their hands and wringing them before they lay them out on the grass to dry. The women wear but one garment, the 'sarong,' a bag-like skirt as wide at the top as at the bottom fastened over the breast by a tight twist and a knot. Their arms and shoulders are bare, and the sarong, soaked as it is, clings to them, outlining their plump, round forms as distinctly as though they were clad in the costume of Eve before the days of the fig leaf. The sun turns their shoulders to mahogany as they rub the clothes to and fro on the stones, and the drops sparkle like diamonds as they throw them up into the air and bring them down with a slap on the steps. They keep at their work until the clothes are perfectly clean and bring them well ironed to their customers.

"Washing in the Philippines is done in much the same way. At every stream in and about Manila you may see such women at work."

Electric Wagon that Hoists Safes

Huge Iron Boxes Carried Swiftly for Miles and Delivered to the Top of Sky-scrapers, All by Electric Power

The very latest thing in a motor wagon is a machine that hoists great iron safes weighing several tons to the top of a 15-story building in a few minutes. Electricity furnishes the power and is supplied from storage batteries carried on the wagon. This system has just been introduced in New York and has been so satisfactory it will soon come into general use in all large cities.

The Automobile and Motor Review of New York, a recognized authority, says in its issue of August 16: "The performance of this electric hoist is a striking illustration of the economy of time and labor made possible where power is available for hoisting. A crew of six men, four at the windlass and two helpers, will hoist a two or three ton safe at the rate of rather less than one foot a minute, whereas the motor dispenses with the four men at the windlass—the driver operating the motor—and hoists the same safe at the rate of eight feet per minute. With a lighter safe the crew could be reduced, on the one hand, and the motor would hoist more rapidly on the other; while with a heavy safe the speed of hoisting would be reduced by multiplying the purchase of the tackle. On a hoist of several stories, where one crew might need to be relieved by another, the advantage of the motor is particularly manifest."

When an order is received to move a safe the electric wagon is run to the building, the ropes and pulleys are hung from the roof or upper window and the ropes securely attached to the safe. This done, the hoisting motor, which is placed under the driver's seat, is started and in a few moments the huge mass of iron is swinging in mid-air. The motor is then reversed, allowing the rope, which is wound around a drum, to run out slowly until the safe is lowered into the wagon. Another motor is then set in motion and the truck with its heavy load moves rapidly away to the new destination, sometimes several miles distant. On arrival the ropes and pulleys are swung and the motor starts the drum, winding in the rope, and raising the safe swiftly and noiselessly, while hundreds of people pass in safety along the sidewalk below. The trucks are very strongly built and, of course, heavy, the storage batteries alone weighing 2,300 pounds.

Modern Safe Hauling and Hoisting in New York City.

A Watt engine which had done service in England for 102 years was recently removed from its sphere of usefulness to a London museum. The long life attained by many of these English engines show that they must be remarkably substantial in their construction.

WARRIORS GO MAD MOST EASILY.

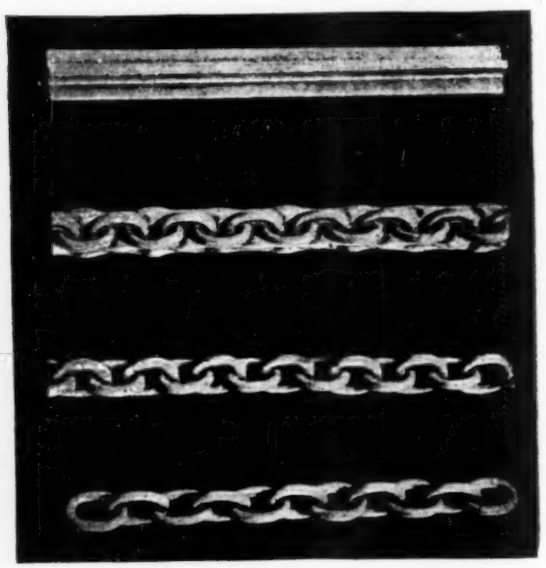
Brains of naval and military men are said to give out most quickly. A French investigator has discovered that out of 100,000 men of the army or naval profession, 199 are hopeless lunatics. Among the liberal professions artists are first to succomb to the brain strain, next lawyers, followed at considerable distance by doctors, clergy, literary men and civil servants. Striking an average of this group, 177 persons go mad to each 100,000.

Intelligent people read Popular Mechanics, and some of them say it is the most interesting journal published.

The Illinois Central Railroad will begin operating a line of steamships betweeen New Orleans and Havana, Cuba, Oct. 1.

WELDLESS CHAINS.

The Engineering Times of London describes the manufacture of chains without any welding of the links. This is done by taking a long red-hot steel bar of suitable size and passing the

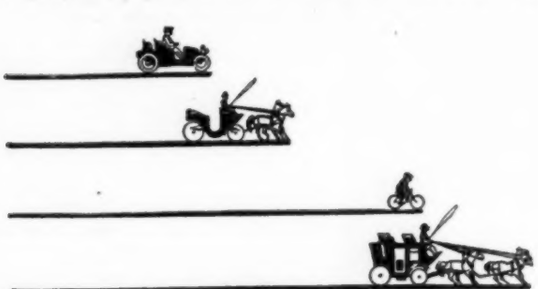


Bar of Iron Stamped Into a Chain.

bar through a powerful press, which by a series stamps out the links. The illustration shows the four stages, or impressions, from the start to finish. A link one inch thick when finished is about the limit of size. Weldless chains are stronger than welded links and wear longer.

AUTOMOBILE THE SAFEST VEHICLE.

Recent tests to determine the margin of safety of various vehicles establish the fact that the automobile may be stopped quicker to avoid collision or accident than any other vehicle. The relative distances required to bring the vehicles from different speeds to a standstill is shown in the accompanying diagram.



Margin of Safety of Vehicles.

The automobile traveling at 22 miles an hour stopped in 31 feet; the trotting team at 21½ miles, in 43 feet; the bicycle at 20 miles, back pedaling only, in 63 feet, and a four-horse tally-ho at 17½ miles, in 79 feet.

So great is the demand for American electrical apparatus in Europe that the Westinghouse Company has found it necessary to make extensive additions to their plant in Havre, France, which has been in operation but five years. This plant supplies the territory included in Holland, Belgium, Italy, Switzerland, Spain, France and their colonies and protectorates.

RAILROADING IN SOUTH AFRICA.

Interesting Experience of an American Railroad Man in the Natal Government Railway.

An American railroad man, A. M. Strong, who wanted to see the world, tells in the Age of Steel his experience in South Africa: I applied for position as conductor, the examination was easy, and I was given a blue uniform with red trimmings, an overcoat and cap, and was put in as a learner for three weeks at $1.85 per day. At the end of that time I took my second examination and was given a train. The book of rules contains 165 pages, with an appendix of 216 pages and working time table of 45 pages.

My first trip was made up the main line to Botha's Hill and return, a forty mile "double" on a "goods train." All freight there is "goods," whether it be stone, coal, stock or merchandise, and it is all loaded in cars—"trucks" they call them—of about the style of the old-fashioned American coal car. If the load be susceptible of damage by exposure, a tarpaulin is stretched over it, otherwise it is exposed.

When I got to the yards I found my train already "marshaled" (they don't switch cars over there; they marshal the trucks or carriages) and all ready to leave. I compared time with my "driver"—I had a "Waterbury," considered a very good thing over there—and after looking over the couplings, all link and pin, and of every age, style and condition, and seeing that the vacuum brake was properly connected—it was the old style Eames—we pulled out. We made the trip all right and were back in Durban before dark.

A guard has absolutely nothing to do with his train except between stations, and he has no brakemen.

When a train, either freight or passenger, arrives at a station it comes under the entire control of the "station-master." He, with his native helpers, do all the switching or loading and unloading; arranges the run to the next station, and, when he is through and the train ready to leave, shakes a big dinner bell out of his office window. The guard unrolls his little green flag, the driver whistles—there are no bells on the engines there—and you pull out for the next station in absolute safety so far as any kind of collision is concerned.

The motive power there is all English—ranging from the little marshaling engines of 20 to 40 tons weight, to the big Dubs freight engine, weighing from 70 to 100 tons. These Dubs engines are all 10 and 12 wheel connected, and with no tender. The water is carried in two tanks that reach the entire length of the boiler on either side and the coal in a bunker back of the cab, built on an extension of the engine frame. The valve motion is exceedingly good and they are incomparable hill climbers. The drivers are small in diameter, seldom over 36 inches and never more than 54. They are extremely rigid on the wheel base, yet they make 5 and 6 degree curves at high speed and with great ease. For the larger Dubs, 500 tons is the rating, and they handle a train of that weight up grades of 200 to 240 feet to the mile with perfect ease.

The "permanent way" or main line is the finest I have ever seen. The cuts and fills are all finished with a 25-foot road-bed; on this is two feet of stone ballast, supporting ties of Jarrah wood—all imported. On the face of the tie is a plate of sheet steel and to this is bolted the rail. The track gauge is 3 feet 6 inches and the "plates" or rails are 100 to 120-pound steel.

Passengers must purchase tickets or pay fare on the train from the point from which the train started. If you fail to get off where your ticket reads you pay fare to the destination to which the train is bound. When a ticket is bought the passenger is told that the company does not undertake, under any circumstances, to carry him to his destination; if he gets there it is all right; if not, that is his look-out.

WIRELESS TELEGRAMS BETWEEN AIRSHIPS.

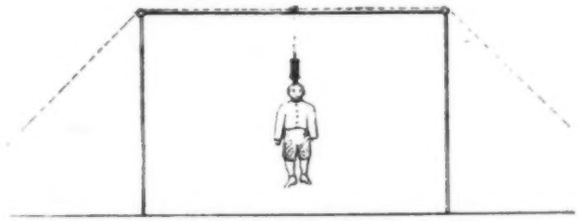
Santos Dumont and Marconi to Unite Their Efforts in a Novel Test.

Before his sudden departure for France recently Santos Dumont, the aeronaut, discussed with W. W. Bradfield, Marconi's American manager, a plan contemplating the use of the Marconi wireless telegraph in connection with the airships.

M. Santos' idea is to take with him into the clouds at the World's Fair aerial exhibitions in 1904 one of the lightest of the Marconi outfits and thus establish wireless communication between the airships. The airship inventor has already learned the wireless alphabet and is learning to send a certain set of sentences. The two instruments, the receiver and the transmitter, with the batteries, weigh only a few pounds, and as the ship has a capacity of five persons, but will have nobody but Santos Dumont on board at the time, the scheme is thought to be perfectly practicable. "To go by yourself on a trip of this kind," said M. Santos, "is, of course, a little lonesome, but to have a machine by your side which practically talks to you would be like a companion."

TRAINING APPARATUS FOR FOOTBALL PLAYERS.

The suspended object shown in our illustration is not a horse-thief nor other dangerous character. It is a dummy, stuffed good



Dummy Football Player.

and hard, for ambitious football players to tackle and otherwise practice on. When seized a spring releases the dummy, which is made life size and weight.

THE WORKINGMAN OF TODAY.

Notwithstanding the great number of strikes and loud labor agitations the workingman is in better condition today than he ever was before. The skilled mechanic of 50 years ago was paid $1.50 a day. Now he gets from $3 to $4.50. He used to work from daylight until dark and his labors were the most toilsome. Now he works eight hours and his duties are comparatively light. The cost of living has increased, it is true, but not in proportion to the increase in wages. The Metal Worker says:

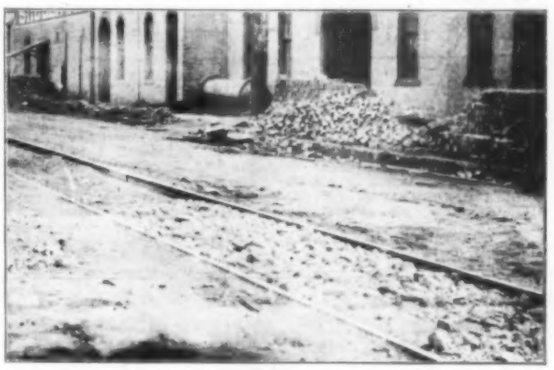
"The twentieth century workman lives better, dresses better and has many more comforts and luxuries, with more time to enjoy them, than his predecessor in the middle of the last century. The wants of the workingman today are certainly greater than they were in the early fifties, but that is because he has risen in the scale of life. Whether, under the strain of modern methods and the limitations of his labor unions, he is happier than the mechanic of fifty years ago is, as Kipling would say, "another story." It is a fact, however, that the workman, as a class, is rapidly nearing his ideal, an eight-hour day—eight hours' work, eight hours' leisure, and eight hours' sleep—with good wages to enable him and his to live comfortably and enjoy the ordinary pleasures of life. This is certainly not an unworthy ideal, and few will grudge the workman its attainment."

The combination knife bayonet, which has been submitted to practical test in the Philippines, has been rejected by the United States board of ordnance and fortification.

COVERS BRICK STREET WITH ASPHALT.

New and Novel Scheme at Decatur Proves Economical and Satisfactory.

Covering brick streets with asphalt is a new departure which has been successfully accomplished at Decatur, Ill. The old brick pavement was first cleaned, dried and especially prepared for the coat of aphalt. The brick made a good foundation. A



Old Brick Street, Decatur, Ill.

good contour and pleasing grade was secured and the appearance of the surface after completion was like that of other asphalt streets. The work was conducted by the Barber company.

Municipal Engineering, an authority on all municipal improvements, in describing the work says: "It is possible to save the property owners, who now have brick or cobblestone streets, coniderable in the coating of their street with a smooth surface of

Preparing Brick Street for Asphalt Surface.

asphalt. It saves much of the cost of a new pavement and the results are good, giving a smooth even surface where before was a rough, uneven and noisy thoroughfare."

AMERICAN APPLES IN CHINA.

In apples the Pacific coast is finding a lucrative market among the swarming millions of the Orient that promises as well as does the newly found market in China for American grown wheat, mentioned in Popular Mechanics, April 5. Consul Miller, from Niuchwang, China, instances a shipment of 50 boxes of apples from Portland, Ore.

They were packed in ordinary light 10 by 11 by 22 inch boxes, cleated on both sides, and the apples were wrapped in paper. The packages held in good shape, and every box arrived intact. The percentage of loss was greatest with the Red Russian variety (75 per cent) and least with the Ben Davis (2 per cent), the Spitzenberg lost 10 per cent, the Shannon Pippin 25 per cent, and the Jonathan 50 per cent. California ships a quantity of third-grade yellow Newtons to China. Some of these, says Mr. Miller, are consumed by foreigners, but most of them go to the Chinese fruit stands and restaurants and are eaten by natives.

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HOW LAUGHING GAS IS MADE AND USED.

Dentists will be interested in the following description by W. A. Roddy, D. D. S., of St. Louis, of how nitrous oxid gas is made and used:

In order to have perfectly pure gas, first see that the apparatus you use is in perfect condition; then test the ammonia by taking half tumbler of water, put one teaspoonful of ammonia in glass of water, and if the water becomes milky it will not do to use. After procuring pure ammonia, place two to three pounds of ammonia salt in the glass flask, then apply heat. Great care should be taken to guard excessive and irregular heat. Ammonia salt melts at about 230 degrees; at 396 degrees it begins to decompose into nitrous oxid and water, yielding 36 parts water and 44 parts gas.

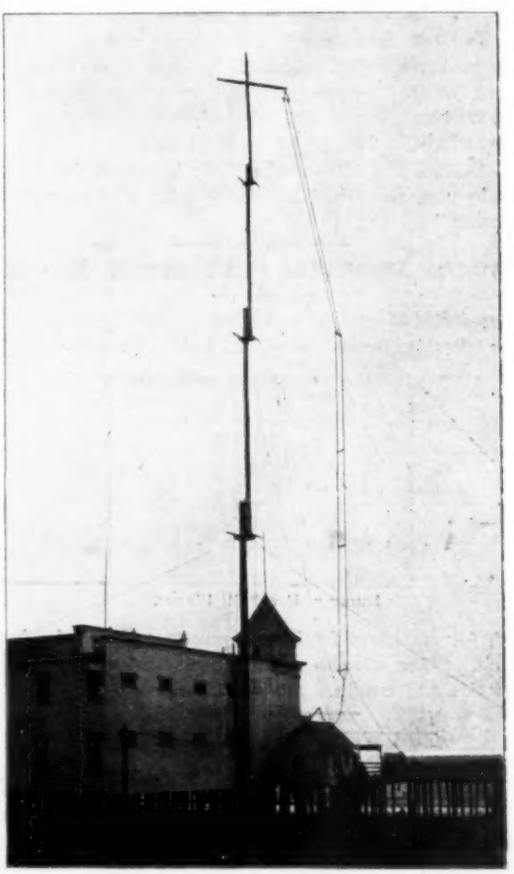
Care should be taken to guard against excessive and irous compounds form with the nitrous oxid, which if allowed to any considerable extent may prove fatal to health and life. When at the proper heat, that is, when melted, make the connection with the water bottles, having at least three bottles, one to contain caustic potash to destroy all impurities. Allow the gas to flow through the bottles into a tank of water, where it should stand from six to fourteen hours before being used, the water taking up the impurities. I prefer gas from twenty hours to three days old, for while it takes more gas to get the patient completely under the influence, the after effects are better, not leaving the patient with headache or nausea. The fresh gas has a longer effect than the older, so when there are a number of teeth to extract I use the fresh gas. I use an inhaler which does not have a rubber cup to cover the face and frighten children, or even grown people. I do not use the rubber bag for measuring the amount of gas to be given, but take it direct from the tank, using my own judgment as to when I can begin to operate, by lifting the hand, or watching the eyes, or moving the head to see if the muscles have relaxed, and by the breathing.

The elaborate plan for a naval base and dockyard prepared by a board of army officers does not show promise of realization. President Roosevelt has revoked the order setting aside the land at Olongapo, L. I., where the station was to have been established, and it is believed that the whole scheme has fallen through.

TALLEST MAST IN AMERICA.

Towers Above DeForest Wireless Telegraphy Station at Coney Island.

For the transmission of wireless telegraph messages by the De Forest system, the tallest mast in America has been erected at Steeplechase Park, Coney Island. It is a stick of four pieces towering 210 feet high. This system, which bids fair to supplant all others in the United States, is the result of exptriments conducted by Dr. De Forest at the Armour Institute in Chicago. He was ably assisted by E. H. Smythe of the Western Electric company. The two scientists invented a new receiver which greatly simplifies the work of wireless telegraphy. Their device is called a "responder" and depends on an electrolytic principle for its action. Because of its automatic quality it is possible to use a telephone in circuit with the device and the employment of a relay is rendered unnecessary. By this means a speed of 40 words a minute can be obtained. The station shown in the illustration is the most important yet established by the company. It is supplied with 60-cycle alternating current at 110 volts from the Edison mains.



Wireless Telegraph Tower, 210 Feet High.

E. J. Taylor of Saratoga uses a carriage which is 135 years old and in good condition. It has been in almost constant use, except for three years during the revolution, when it was hidden in a sequestered place in the woods to save it from the enemy. The vehicle has all the time remained in the Taylor family.

The oldest engine now in service is one at a colliery near Rutherton, Scotland. It is a Newcomen engine and was erected in 1802, since which time it nas been in continuous service and needed no important repairs.

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LOCOMOTIVES OF A CENTURY.

Being an illustrated history of locomotive invention, building and progress in America, the data for which was gathered by S. M. Vauclain, the noted mechanical engineer. For the illustrations, showing the evolution of the locomotive from its inception to the present time, we are indebted to the Baldwin Locomotive Works Company, which has spared neither pains nor expense in making the pictorial features of the history complete.

We now come to an era in the building of locomotives where freak designs cease to appear and where the engine has settled down to a conventional form quite similar to those we see pulling the trains of to-day. The year 1870 may be said to have marked a new epoch in locomotive building. In that year the practice of shrinking steel tires on driving wheels without shoulder or set screws, which is now general, was inaugurated. The double-ender, Fig. 33, made its appearance at this time, and in 1874 the first compressed-air locomotive for street-car work was made by the Baldwin Locomotive Works.

Still greater impetus to locomotive improvements was given by the exhibition in

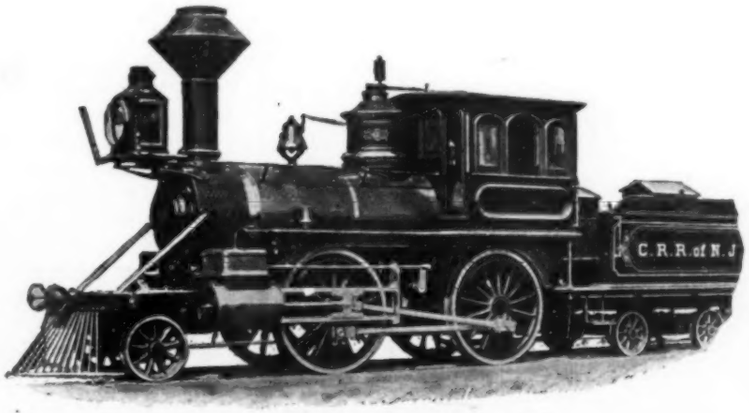


Fig. 33—Baldwin Double Ender, 1871.

Philadelphia in 1876, which was followed by better types of engines on all the railroad lines. In 1877 John E. Wootten introduced the wide firebox projecting over and above the driving wheels, which is being used to a considerable extent to-day, and modifications are being extensively introduced. In 1880 high speed commenced to worry the locomotive builders, and the engine shown in Fig. 34 illustrates what was then considered necessary. This was the forerunner of our present most successful high-speed engines.

The year 1885 marks the introduction of the "Decapod" type of locomotives, or locomotives with five pairs of coupled wheels and a pony truck (Fig. 35). Engines of this type have frequently been built, but, owing to the constantly increasing weight of rail used, the consolidation engine has so far been able to supply the general demands of service. A number of these decapods were recently built for the Santa Fe Railroad, but several of them have since been temporarily withdrawn from service and the largest was wrecked a short time ago while pulling a train across the Step Raton mountains.

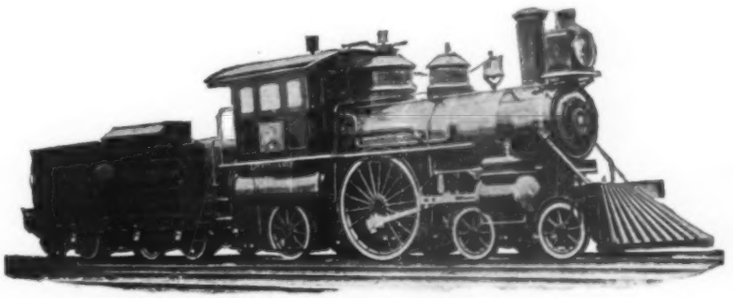


Fig. 34—Baldwin High Speed Locomotive, 1880.

AMERICAN EQUIPMENT FOR LIVERPOOL LINE.

The Mersey Tunnel Railway, which connects Birkenhead and Liverpool, England, and passes under the river Mersey, is being transformed from a steam to an electric line, and the power plant and the entire electrical equipment is being supplied by the Westinghouse Works at East Pittsburg. The route of the road is 4½ miles long, the total length of track, including sidings, being about 12 miles. The line is to be fitted with the third-rail system. The power generating plant will have an aggregate output of about 6,600 horse-power—6,000 horse-power for the railway proper and 600 horse-power for lighting.

In Boston a photographer is employed to make snap-shots of all city workmen found loafing during working hours. The pictures are sent to the deputy superintendent of streets, who administers the proper punishment.

FIRST MESSAGE TELLS OF WEALTH.

The first message to the outside world by wire from Valdes, Alaska, has been received at Seattle, the telegraph line just having been completed. The telegram stated that Robert Blei, the expert sent into the Nazine river district by Capt. Delamar, had just reached Valdes and reported that the Nazine district has the greatest mines in Alaska. The richness of the country, Mr. Blei says, insures the building of a railroad at the earliest possible season. Mountains of tin have been found near Mount Wrangel, 150 miles distant.

Astronomer William H. Wright of the Lick Observatory has been placed in charge of the D. O. Mills expedition to make special researches among the stars of the southern hemisphere.

Farmers and butchers who are opposed to the methods of the stock yards and packing-house combine have formed a company and are to establish a rival plant in Chicago.

Newsdealers everywhere sell Popular Mechanics. You ought to read it every week.

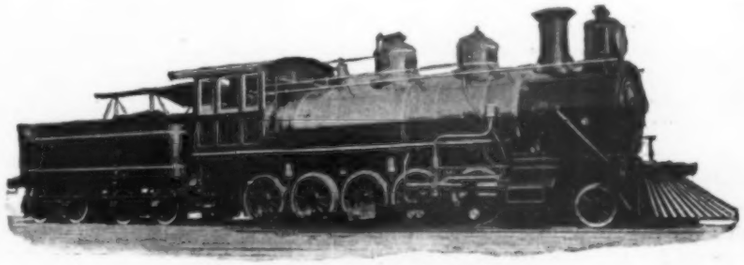
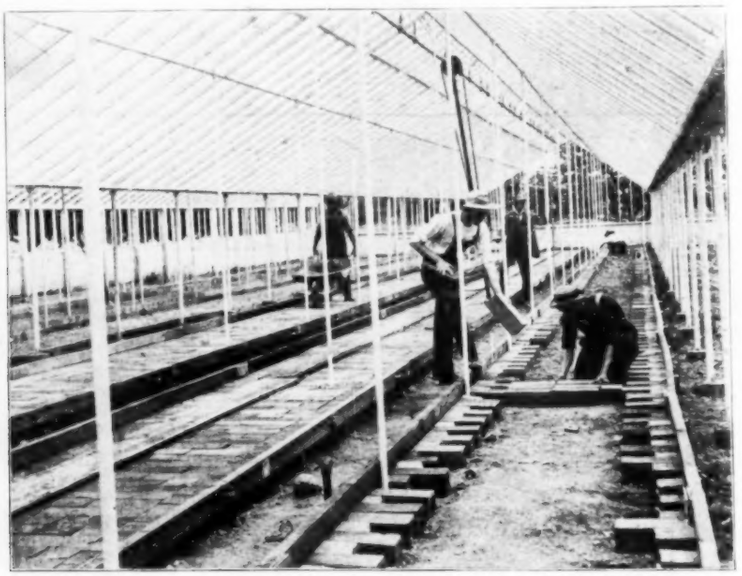


Fig. 35—Baldwin Decapod, 1885.

TILE-BOTTOMED BEDS FOR GREENHOUSES.

Latest Device Affords Perfect Drainage, Ventilation and Distribution of Light.

Making an elevated floor of hollow brick instead of using the old-fashioned plank



Laying the Hollow Brick Floors.

floor benches is the latest thing in greenhouses. The system is to make longitudinal beds of the hollow brick or long square tiles. They are considered superior to the drain tiles for the bottom of a bed, for having flat sides, they do not roll and the soil is more easily shoveled off when renewing has to be done. They are said to afford the most perfect drainage, and permit the air to pass freely beneath the roots of the plants. In the house shown in the accompanying illustration the gutters average 6 feet 6 inches above floor level. There are no partitions; merely a 2-inch pipe every 5 feet 7 inches supports the gutter.

The Florists' Review, the recognized medium of plantgrowers, in speaking of the device, says: "It is very evident that the higher the gutter and the house and the lower the beds the more light will every rose plant get. At present every spot in these houses is a little lighter than out of doors."

RAISES GOATS TO FEED WILD BEASTS.

Raising Angora goats as food for lions and tigers is a queer industry, conducted on a farm near Greensboro, N. C., by John S. Sparks. The farm is mostly mountain land, and the 200 goats imported by Sparks have been turned loose to clear the mountain sides of the shrubbery and noxious growth so that it can be turned into stamping grounds for the wild animals. Lions, tigers, camels, elephants and other such animals will be kept on this land in seperate inclosures. After the goats have properly fitted the land for this purpose they will be turned into food for the beasts. Since the goats have been placed on the farm they have increased very fast and shown such wonderful industry in cleaning land that the owner expects excellent results in breeding the wild animals. The young kids are sold in large quantities for food to the inhabitants of the neighborhood, and quite a revenue is also derived from the fleece of the goat, which is long and as fine as silk, while the hides make the finest leather.

FEED STORE OR COOK SHOP.

The English of England and America are not the same, relates the Keystone in describing the effort of an English editor to make plain to his readers an item he desired to copy. In a biography of a successful man in the American paper it was said, "his father kept a feed store—sold baled hay to small buyers." They don't have "feed stores" in England, so the editor tried to translate the term. He easily made shop out of store, and construed "feed" to mean a lunch or meal. By combination he evolved the following: "His father kept a cook shop—sold baled hay to small buyers!"

NEW GASOLINE INSPECTION CAR.

Novel and Serviceable Device That May Become of General Use on Railroads.

A unique design of inspection car has recently made its appearance in Indiana and may soon be adopted by many of the leading railroads. It is kind of a track automobile with little upper construction to add to its weight, which amounts to 500 pounds. As the front wheels are independent of each other on the axle, however, the weight that actually has to be lifted at one time in removing the car from the track is but 175 pounds. By lifting up the rear end it can easily be swung round, and hence it can be removed from the track by one man. The car is driven by a 2½ horse-power gasoline motor of the inclosed type, running in oil.

The Railway Review in describing the device says: "The car can be stopped when desired without stopping the motor. It is equipped with tanks holding about five gallons of gasoline, which is enough to run under ordinary conditions about 175 miles. The vibration is almost completely done away with. There are seats for three persons, and a fourth can be carried if desired."

New Type of Motor Inspectior Car.

Saves Time and Labor in Loading Ties

New Machine Makes Easy a Task Once Abhorred by Laborers

Angler Tie-Loader—View of the Loading Platform.

A tie-loader which has been placed in service at the tie-preserving plant of the Burlington & Missouri River Railroad at Sheridan, Wyo., has done away with the laborious task of lifting the timbers by hand and has proved a wonderful saver of time. With the machine a truck containing 30 ties can be unloaded and stacked in the car in two minutes. Six men can easily handle 3,000 ties in ten hours. The same work formerly required the efforts of ten men and twice the same amount of physical exertion. The tie unloader is shown in the accompanying illustrations. It is the invention of F. J. Angler, superintendent of the tie-preserving plant.

The Railway Review, the great authority on all new railway appliances, says: "The treated ties weigh 200 lbs. and more each, and when the ties were loaded entirely by hand the work required two men to a tie. To keep this up day after day tires out the strongest man, and the plant was constantly changing hands. The loader consists of an overhead track with trolleys and stirrups for carrying the ties. The portable track is set upon an A-leg placed on the tie-loading platform, and inside the door it separates and runs to either end of the car, being supported upon hangers, which can be clamped to the car lines. The trolley consists of a single wheel and hook, and the stirrup or carrier is an L-shaped iron hanging from a piece of chain, which is provided for the purpose of adjusting the height of the stirrup to that of the pile of ties on the track."

The apparatus is easily transported.

Angler Tie-Loader—View Inside the Car.

NEW TARGET PRACTICE DEVICE.

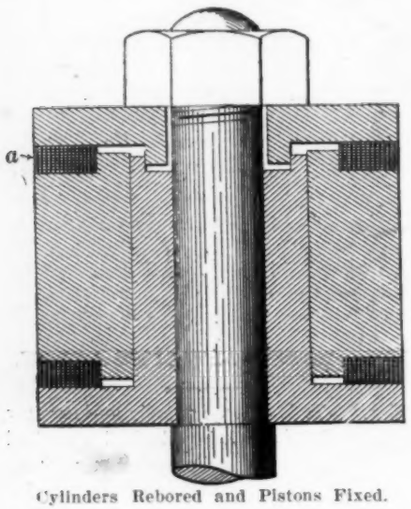
Gen. R. P. Hughes, formerly an inspector general of the army, has devised a method of carrying on target practice at military posts where the available arrangements for such work is limited. The device consists of a number of shields with openings through them, the shields so placed in a line along the range as to have the openings form a sort of alleyway, through which the firing is done. The target is placed at the end of the route. The board of ordnance and fortification has made an allotment of $3,500 for a test of the Hughes system at the presidio of San Francisco.

Popular Mechanics is "written so you can understand it."

SHOP NOTES

A TROUBLESOME PISTON CURED.

The accompanying sketch refers to a water-end feed pump piston, working against 160 pounds pressure. Cost of repairs for this pump during the first four years it has been in use amounted to more than its original cost, all on water-end pistons and reboring water-end cylinders, be-



Cylinders Rebored and Pistons Fixed.

sides an endless amount of labor and trouble, says Power. Two years ago the cylinders, duplex, were again rebored and pistons fitted as per sketch. The packing is simply flexible fiber rings, ¼ inch thick. Solid pistons had been tried previously, also metallic spring rings, also soft packing. Every twenty-two days, or a little longer, the piston nut is set up hard, nothing else has been done since, and cylinder bore has not worn more than 1-100 inch.

CAUSE OF INFERIOR GALVANIZED SHEETS.

The difference in the cost of producing a first quality galvanized iron sheet and a poor one is very small. The London Ironmonger gives the cause of poor sheets as the result of trying to meet competition by saving a few shillings a ton in the manufacture, usually by omitting the annealing when galvanized. This affects the appearance but little when new, but renders the sheet more liable to exposure to the air. Others stint the spelter. Then the sheets must be thoroughly dried before packing, or they will sweat when shipped by sea. The use of acid steel bars in the production of the black sheets under proper conditions need not cause defects.

A perfect sheet must be annealed, pickled, dipped and dried. Each process must be carried out thoroughly and the best available materials must be employed. If all this has been properly done the crystallization appears as a beautiful white pattern on a deep blue ground. Such a sheet will remain bright and fresh for an almost indefinite period, and it will outlive three or four inferior sheets.

POLISHING GLASS WITH GLASS.

Not all opticians know that glass can be used to grind glass. A small jeweler's polishing lathe is all that is needed to try the experiment. An ordinary empty wooden reel (such as ladies use for sewing cotton) is screwed upon the lathe as a chuck. To the end of the reel is cemented, by shellac or other suitable substance, a watch glass with its concave surface next to the cement, says the British Optical Journal. This, properly centered and set, is made to revolve rapidly by means of a foot wheel attached to the lathe, and upon its rapidly-rotating surface the edge of a spectacle lens can be both quickly ground and smoothly finished. Grooving can also be done upon the edge by means of a suitable hand-rest.

REDUCING OVERPRESSURE IN STEAM BOILERS.

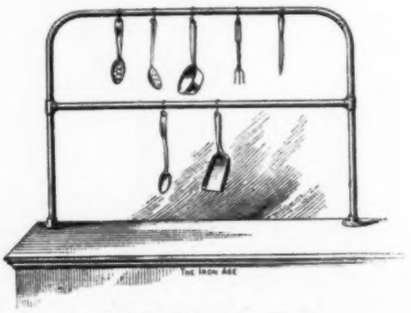
When a boiler is under excessive pressure the very first thing to do is to deaden the fires, so that the cause of the increase of pressure may be removed at the earliest possible moment, says R. A. Douglas in the American Electrician. It is quite common to draw the fires, but it is much better to cover them with green coal or ashes. It is often thought that ashes are better for this purpose than coal, presumably because coal is combustible, while ashes are not; but coal is equally good, and, moreover, it is always at hand, while ashes are not. The layer of coal that is applied should be thick and generous, so as to intercept as much as possible of the radiant heat that would otherwise reach the shell of the boiler, and because it is desirable that no considerable amount of air should draw up through the grates. Heat cannot be generated in a furnace without combustion, and combustion cannot take place without air; so that if no draft passes up through the fuel on the grates, there will be no further combustion and therefore no further generation of heat.

TO PICKLE BRASS CASTINGS.

The following method of pickling brass castings is recommended: If greasy, the castings should be cleaned by boiling in lye or potash. The first pickle is composed of nitric acid, 1 quart; water, 6 to 8 quarts. After pickling in this mixture the castings should be washed in clear warm or hot water, and the following pickle be then used: Sulphuric acid, 1 quart; nitric acid, 2 quarts; muriatic acid, a few drops. The first pickle will remove the discolorations due to iron, if present. The muriatic acid of the second pickle will darken the color of the castings to an extent depending on the amount used.

HOME-MADE PIPE RACK.

A pipe rack for the display of many small articles in a store can be easily made of



Articles Hung on Rack.

1-inch water pipe, says the Iron Age. The cut explains the construction. The articles are hung from hoods made of copper wire bent into an S.

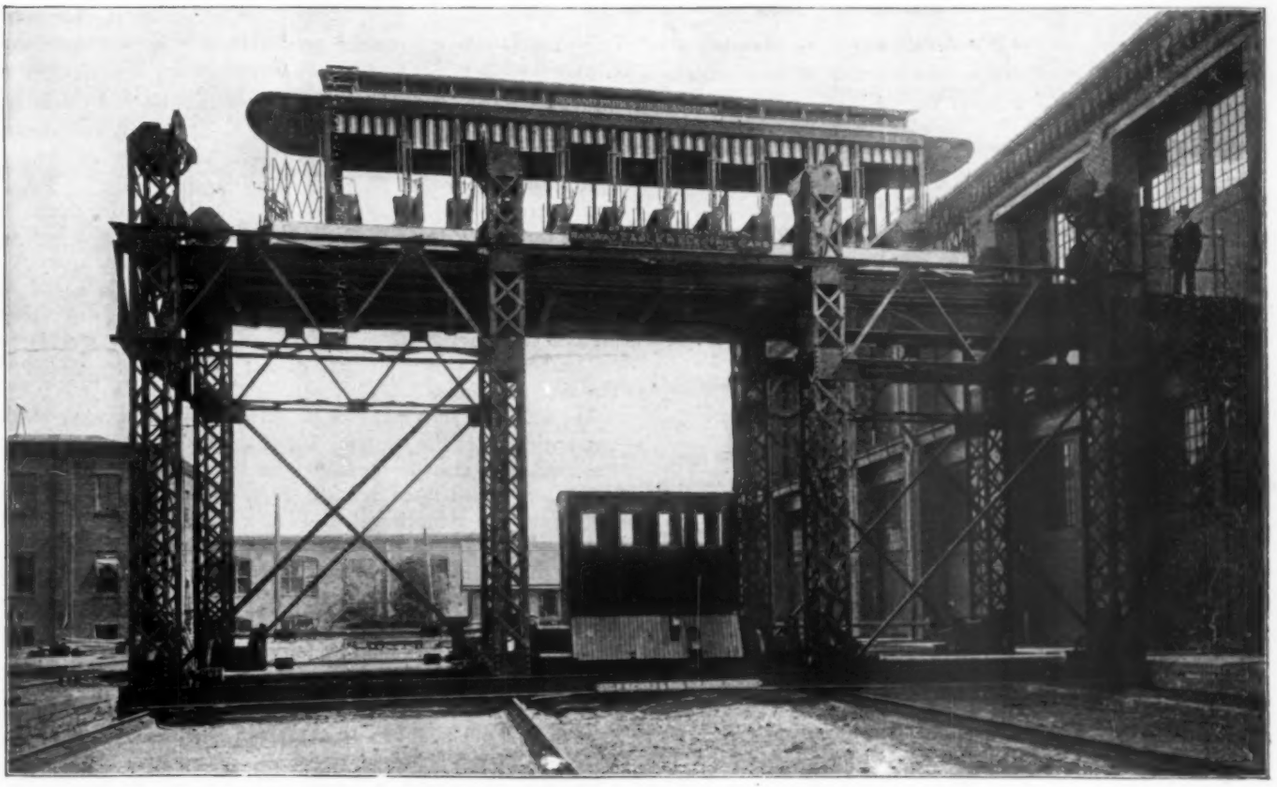
PROTECT TREADLES OF DIE PRESSES.

A manufacturer who employs a great many presses reports a curious accident, says the Metal Worker. A pile of blanks ready to be drawn, standing alongside of the press, fell over while the operator happened to have his hand under the die, and these blanks fell on the treadle, releasing the clutch, causing the punch to descend on his hand. This occurrence suggests the desirability of putting a wooden box around the treadle or a shelf over it, in such a way that if anything falls it will not hit the treadle, leaving room, of course, between the treadle and the top of the box for the foot.

OUR BRAINS ARE 70-YEAR CLOCKS.

Dr. Oliver Wendall Holmes once said: "Our brains are seventy-year clocks. The Angel of Life winds them up once for all, then closes the case and gives the key into the hands of the Angel of the Resurrection. Tic-tac! go the wheels of thought; our will cannot stop them; they cannot stop themselves; sleep cannot still them; madness only makes them go faster; death alone can break into the case, and, seizing the ever-swinging pendulum which we call the heart, silence at last the clicking of the terrible escapement we have carried so long beneath our wrinkled foreheads."

Combined Elevator and Transfer Table



Combined Car Elevator and Transfer Table.

The accompanying illustration shows a novel construction which has been put in use at the works of the Brill Car Co. at Philadelphia. The structure is strongly built of steel and is carried on wheels which run upon four rails. When it is desired to take a car to the second story the platform is lowered by means of steel ropes and the car run on. An electric motor furnishes the power to raise the platform and car. When at the proper elevation the motor is used to move the entire structure to any part of the building, and the car is run into that department of the shop where the special work desired is done. The Street Railway Review says the table is 50 feet long, 20 feet high, and will raise a car weighing 40,000 pounds at the rate of 15 feet per minute. The electric motor stops of itself when the car reaches the top.

WRECK OF THE WORLD'S LARGEST LOCOMOTIVE.

The Santa Fe Railroad continues to have trouble with its giant locomotives of which so much was expected. After having to withdraw several of them temporarily from service, the head officials have been still further disheartened by the wreck of one of the greatest of the great locomotives on the system. This was the largest locomotive ever built. In company with two other engines the giant "iron horse" was taking a long train over the Step Raton Mountains. Three times the train broke in two. When the last break came the long train started to back down the steep grade. The huge locomotive was unable to hold it. What happened is thus described by the Scientific American:

"The brakemen, after having tightened every available brake, were finally compelled to jump for their lives. After a mad downward plunge of three miles the train jumped the rails on a bridge 50 feet high near Seymour. The engine and all the cars plunged down the canyon."

WARM DIAMONDS BREAK EASILY.

Diamonds are easily broken by being warmed and permitted to drop on a cold, hard surface. Secretary Harry Pulliam of the Pittsburg Baseball Club recently smashed and utterly destroyed a $500 diamond in this manner. The stone was set in a ring which had been given him by the Pittsburg team last fall. Mr. Pulliam was bathing at the time. He had his hand in warm water and the ring was still on his finger. He started to take it off, when it slipped and fell from his finger to the marble floor of the bath-room. The gem was warm and the marble floor was cold. The stone was shattered and ruined. Some years before a Louisville woman broke a large diamond in identically the same manner. At the Hoffman House in New York one time a gentleman took from his wallet a stone valued at $4,000 to show to some friends. It slipped and fell to the marble floor and was literally shattered. These diamonds might have been hit with a hammer a hundred times under ordinary conditions without breaking.

REMOVES POWDER STAINS FROM FACE.

It has been discovered that hydrogen dioxide will remove powder stains from the faces of the living. The method was first suggested by Dr. Neely Rhodes, and has since been successfully employed by Dr. Clark. A boy came to Dr. Clark's office with his entire face and neck blackened with powder stain. His face was first washed thoroughly and several grains of powder were picked from each eye. The boy was then sent to a hospital and orders were given to keep the face covered with pieces of lint saturated with glycerine, one part, and hydrogen dioxide, three parts. In a couple of days all the particles and stains were entirely removed without resorting to the tedious and painful picking process usually employed, and all marks promptly healed.

Baffinland, lying north of Labrador, is about ten times the size of Scotland or Ireland, and only the southern coast has ever been explored.

Summer Course in Easy Mechanics For Boys.

By Wilbert S. Drew.

[This series, commenced in issue of June 28, will continue each week. It will give instructions which any boy can understand, how to use carpenter's tools and make things. In doing this only a few tools will be required, and cost of material will be small. The articles to be made will include a boat, table and similar subjects.]

BUILDING A CAMP.

This camp, with slight alterations, was built by two young men in Southern Michigan. It has been in constant use for three summers and has been a source of considerable satisfaction to its owners.

The time occupied in building was about two weeks and the cost of materal $41.

The building is 12 x 14 feet on the ground and the foundation

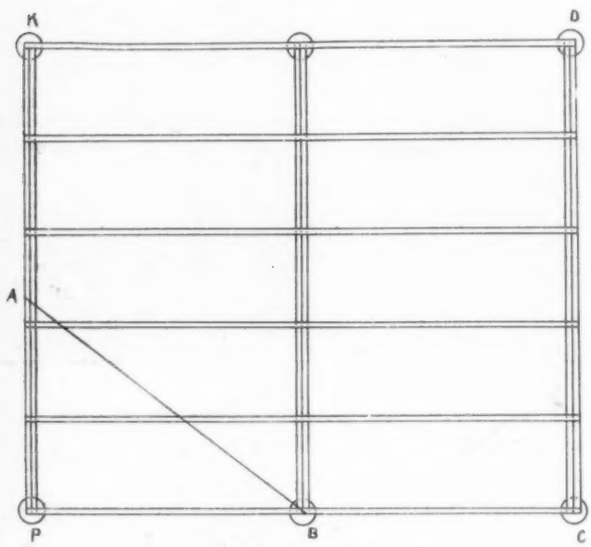


Fig. 1—Foundation.

consists of 6 posts, 8 inches in diameter set in two rows. The rows are 12 feet apart and the distance between centers of posts in each row is 8 feet. They should be sunk in the ground at least 18 inches and the soil well tamped around them. Their tops must all be set in the same plane and this may be accomplished by placing a straight edge across two of the posts and using a level on the straight-edge. Begin at one corner and go around, taking the posts successively by twos, until all have been leveled. The order will be 1 and 2, 2 and 3, 3 and 4, etc. The corners will also be squared and this is done by the method indicated in Fig. 1. A 10-foot pole is used to measure off 6 feet in one direction as P A and 8 feet along P B. Lay down two of the floor joists on which these distances are marked, the joists touching at the corner and lay the 10-foot pole across the angle as at A B. If the ends of the pole just touch the marks the corner is square; if they do not do so, move one or both joists until the ends of the pole do just coincide with the marks. Having established the direction of two sides in this way the other corners are squared from these lines. The two sides indicated must not of course be moved after they are located but the other sides as C D and D K are moved in order to square the three corners C, D and K.

When the posts are set and leveled, spike two 2 in. x 6 in. hemlock timbers together, side by side, and place them across the posts P and A with the 6-inch dimension placed vertically. Put two more, nailed together in the same way across C and D, and another pair across the middle posts. These are laid in place without nailing to the posts at first. On top of the sills place a single 2x6 on edge from K to D and another from P to C. Try the corners again to see if they are square and if so spike the sills securely to the posts and nail the floor joists KD and PC, to the sills. Put in four more floor joists, making six in all, at equal distances apart and nail in place.

The floor is next put on and consists of hemlock boards 1 inch thick and dressed on the top. These boards are 12 feet long and are nailed to each floor joist with 8-penny nails.

The studding is of 2x4 dressed hemlock and there are five pieces on each side of the building. Their length is 4 feet and they are placed on top of the floor at equal distances apart with their 4-inch dimensin set at right angles to the walls and the lower end of each is nailed firmly to the outer floor joist. There are two studdings at each end and these run up to the end rafters.

The plate is a piece of dressed 2x4 nailed flatwise on top of the side studdings.

The sides and ends may now be boarded in with weather boarding, beginning at the bottom. Board the ends up to the peak of the roof and saw the ends of the boards off even with the rafters, of which there are five pairs, of 2x4, their upper ends resting on the ridge board of 1 in. x 8 in. hemlock, and their lower ends shaped as shown in Fig. 2, which is an end elevation of the frame. Nail the rafters together at the top and to the plate with 10-penny nails.

Collar girts C, Fig. 2, are nailed across each pair of rafters, except the end ones, and are 1 in. x 8 in.

The pitch of the roof is 45 degree, or what is known as half pitch, so the ends of the rafters are sawed at an angle of 45 degrees and are laid out as explained in a previous article on building a pigeon house.

The door is 2 ft. 6 in. by 6 ft. 6 in. and is placed at the middle of one end. The frame is of 2x4 stuff and the end boards are nailed to it. A sash-door with glass in the upper panels, is desirable because it admits the light. The window is 2 ft. by 4 ft. and is placed in the middle of the opposite end. It may be arranged to slide to one side or it may be hung on hinges. The

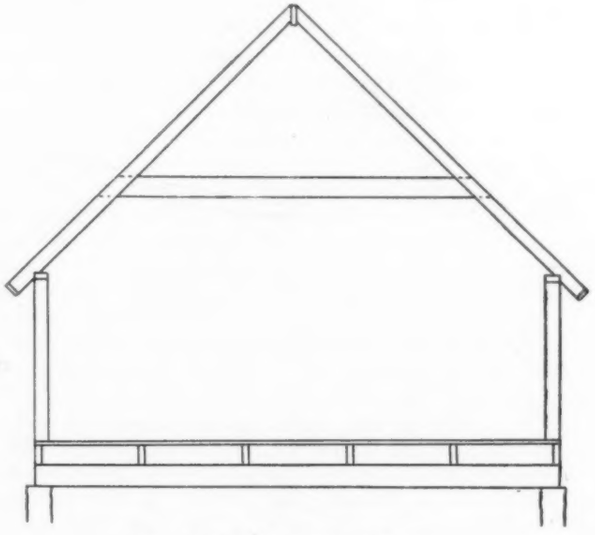


Fig. 2—End Elevation of Frame.

roof boards are of 1-in. hemlock 12 inches wide and 16 feet long, so that they extend a foot beyond each end of the building and the eaves should project at least 6 inches beyond the sides and a strip of board is nailed along the lower end of the rafters, as shown in Fig. 2. Another strip of the same width is nailed to the ends of the roof boards and mitered at the peak of the roof.

The shingling is done as described in the previous article above

mentioned and the shingles used ought to be of first quality, although there is no objection to their being narrow.

Owing to the high price of pine, Norway pine is much used now for siding, but in order to attain good results it must be correctly treated. It should be kept dry, as it springs badly if allowed to get wet. A good plan is to paint all the boards with very thin paint of oil and white lead before putting them on, and no more paint should be applied the first year, because if too much is put on at first it will peel off. The second year two more coats of thicker paint may be added.

If a temporary camp only is wanted a very satisfactory way is to use ordinary hemlock boards for siding and cover them with the best quality of roofing paper. If this is given a coat of paint as often as it shows signs of wear it will last for several years and is quite inexpensive.

Much may be added to the comfort of the occupants of the camp if a porch is built on the front by extending the floor joists about six feet, spiking a 2x6 to their outer ends and setting posts under the outer corners. This frame is then floored over and a railing added. If in a timbered country, a very neat railing may be made of the trunks of small trees, and comfortable chairs can be made from the same material. The seats are easier if the cross pieces are split and the flat side turned upward.

An excellent storage space is furnished by placing two or more 12-inch boards lengthwise on the collar girts, and if the structure is made strong enough this upper part can be used as sleeping quarters for two persons.

A dining table can readily be made by nailing crosspieces to three of the studs, putting uprights under the outer ends of the cross pieces and laying two or three boards across the top.

A small table on which to write or to place a lamp, can be made by taking a soap box or small packing case, removing the cover, turning it bottom upward and nailing four pieces, 1 inch square and 30 inches long, one into each corner. The top is then covered with white oil cloth, which also serves well as a cover for the dining tables, as it looks well and is easily kept clean.

Hemlock boughs serve very well for a temporary bed, but if the camp is to be occupied all summer a good bed with woven wire or springs and a mattress is more comfortable.

A blue-flame oil stove is convenient for cooking and the oven serves to heat the apartment and to dry it out when the weather is cold and wet.

If wood is plentiful and cheap a wood stove may be used, but it is neither so convenient nor so good to cook upon as the oil stove. The latter requires no time in preparation of fuel, which is quite an item when one wishes to be abroad in the woods or upon lake or river.

A refrigerator may smack too much of city life to please some, but if in a place where ice is to be had it adds much to a season's enjoyment, and can easily be made.

MARY AND ME.

The automobile flashes by
As jaunty as kin be,
Old fashioned ways are good enough
Fur Mary Jane an' me;
Fur I kin drive with jes' one hand,
An' Mary won't complain—
A hoss an' buggy fills the bill
Fur me an' Mary Jane.

They're buildin' wireless telegraphs
Fur use across the sea;
I don't believe they'll be much good
To Mary Jane an' me.
I'd rather whisper in her ear,
A-walkin' down the lane;
These new inventions ain't much use
To me an' Mary Jane.

Electric lights is bein' hung
From chandelier an' tree;
They don't fill any long felt want
Fur Mary Jane an' me;
Fur as we strolled in years gone by,
We like to stroll again.
The moonlight's plenty good enough
Fur me an' Mary Jane.

—Epworth Herald.

HOW TO MAKE METAL POLISHES.

It is not difficult for any person to make his own metal polish. It can be done cheaply and will probably give you better satisfaction than the polish you buy. Here are a few recipes for good polishing soaps:

1. 20 to 25 pounds liquid curd soap, intimately mixed with about 30 pounds of fine chalk and one-half pound Venetian red.

2. 26 pounds liquid cocoanut oil soap, mixed with 12 pounds tripoli and 1 pound each of alum, tartaric acid and white lead.

3. 25 pounds melted cocoanut oil saponified with 12 pounds soda lye of 38 to 40 degrees B., after which 3 pounds rouge, 3 pounds water and 2 ounces ammonia are crutched in.

WEALTH FROM WASTE

Now accomplished by utilizing the stalks of our great annual corn crop

CORN IS KING

Yet two-fifths of this greatest of crops has been wasted each year because nothing but the ear of corn was saved.

Eighty Millions of Tons of Corn Stalks

are raised and wasted annually in the great corn belt of the United States. Imagine the wealth produced by saving this tonnage and converting it into Pulp for Paper, Feed and Cellulose compounds. This saving of waste will produce $250,000,000 for the farmers annually; wealth and trade will be added to cities and towns securing these plants; new tonnage will be made available for the railroads to haul; new avenues opened for the employment of labor; a better product at a less cost produced for manufacturers of paper and kindred products; no existing industry will be destroyed. All this is an accomplished fact through the great processes owned and controlled by the

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VISIT THEIR DEMONSTRATION PLANT

At 470 West Lake Street, Chicago, Illinois.

Watch the Machines do their Work. See the Product.

Rapid progress is being made with the central Pulp Mill at Kankakee, Ill. Surrounding this mill fifty miles in each direction will be located de-pithing plants to supply the Central Mill. This plan will be followed in other locations until the entire corn belt is covered.

All who have investigated, highly endorse the enterprise, and are eagerly investing in the company's stock.

You can share in the enormous profits to be made in this business by becoming a stockholder in the National Fiber & Cellulose Co. whose shares of a par value of $10 can be had at $2.50 each for a short time only, as only a limited number are to be sold at this price. If you desire further information before investing, write for it. Orders should be sent at once to:

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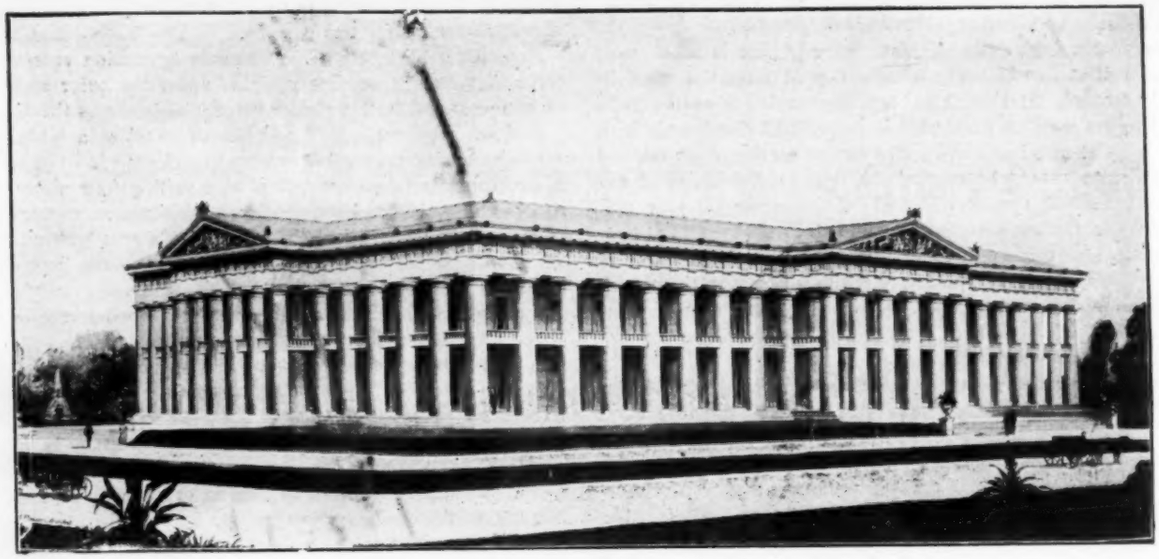
84 Adams St., Chicago, Ill. 170 Broadway, New York City.



Fraternal Building, St. Louis World's Fair.

WHERE ALL FRATERNITIES WILL MEET.

The project to build a Temple of Fraternity at the St. Louis World's Fair has been officially indorsed by fraternal and beneficiary societies representing an aggregate membership of considerably more than three millions. The total fund to be raised for the building is $200,000. Of this the auxiliary board of lady managers will raise $50,000. The Temple of Fraternity is intended to exemplify the idea of fraternity and to show the world the great work the fraternal organizations are accomplishing in modern society.

THE PRIDE OF AMERICA'S GRAIN DEALERS.

Among the large number of publications which it is necessary for the exchange editors of Popular Mechanics to peruse in gleaning the best of the best things published, none are found more interesting than the Grain Dealers' Journal. In this very superior publication are always found items that are helpful to the Journal's constituency and to its publishers, for it is such high-class information that makes the publication so popular and, we might say, indispensable to the grain dealers of all the Americas. Wherever there is interesting and helpful information to be obtained the Journal generally gets it, regardless of cost or labor. More of such publications would serve effectually in elevating the trade press to a higher standard.

WHEN TOWERS AND BRIDGES BREATHE.

To speak of bridges breathing seems passing strange, nevertheless inanimate structures are never still for a moment during the livelong day. The Brooklyn bridge is about 12 inches longer at 3 p. m. on a hot day than it is twelve hours later. Often it is drawn upwards or expanded crosswise or drawn to one side in like proportions, according to the manner of its exposure to the sun. The Britania bridge of London, which is 400 feet long under normal circumstances, is from a half to three inches longer in the heat of a summer day. The Eiffel tower is eight inches higher in summer than in winter. The white marble obelisk at Washington is said to increase its height by two inches and to bend slightly on a hot day. A battleship is more than six inches shorter in winter than in summer, and an ironclad in the tropics is nearly a foot longer than her sister ship in a more northern sea.

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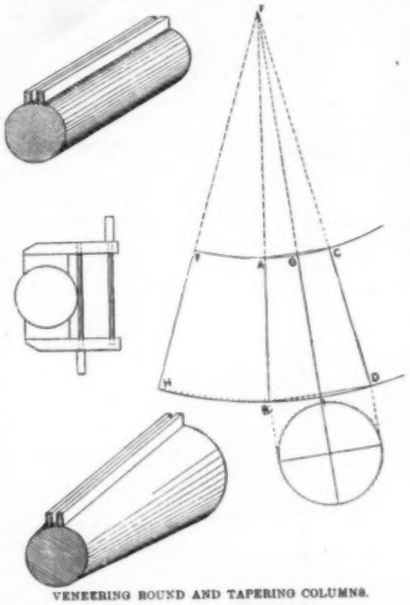
WHEN THE BAND PLAYS.

There's lots of fun in summer;
When the boys is out all day,
An' there ain't no school nor nothin',
So a feller dassent play;
An' the Tenth Assembly picnics
An' the free baths all begin
An' the seashore's just a-waitin'
If a fellers got the tin.
The recreation piers at night
Are no end of a lark,
But all these things look little
When the band plays in the park.
The kids all come a-runnin'
When the leader waves his stick.
You'll never get a seat at all,
Unless you're mighty slick.
There's somethin' chokes your throat up,
An' you're mighty glad it's dark,
You feel so kinder solemn
When the band plays in the park.
—Pittsburg Post.

TO VENEER ROUND AND TAPERING COLUMNS.

The success of veneering columns of different size and shape depends entirely on the proper cauls. Take a circular column of say 3 or 4 inches in diameter, the core to be made of any suitable material. Pass a piece of paper around the core and make a straight joint through the center and the exact size of the veneer is obtained. A caul of tin with a cleat on each end for the purchase of the handscrews is to be made as Fig. 1, leaving the top open for an inch or more to give the glue a chance to escape. Apply the glue to the core and pass the veneer around it, not forgetting, however, to sponge the veneer before doing so. After screwing together put the whole in the steam box to warm up the stiffened glue. After the work has become thoroughly warm take it out and give the handscrews a few turns, then lay it aside until the glue is set. Take off the handscrews and dispense with the tin cauls. The ends may then be brought together as shown in Fig. 2, only the caul on the joint is to be heated. Fig 3 is a



VENEERING ROUND AND TAPERING COLUMNS.

tapering column. The work is the same as above described, only the shape of the veneer is different. The shape here may be obtained either by passing paper around, trimming on both ends and making a straight joint in center of column, or by laying out the diagram, as Fig. 4. In the latter let A, B, C, D represent the column. Extend A B and C D to E. With the radius E C and E D describe the arc C F and D H which will be the required shape, and the distance A F and I H will pass around the column. Under no circumstances make more than one joint.

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The balata tree, from the gum of which a substitute for gutta-percha is made, has been found in abundance along the Amazon river in Brazil. It was discovered by James A. Bouty, for many years a gutta-percha operator in the Guianas. The Brazilians had no knowledge of its gum-producing qualities. Mr. Bouty has succeeded in interesting parties in the United States and the work of producing gutta-percha for the market has already begun. As in the case of rubber, it has been found there is no limit to the supply of the balata along the Amazon, and as it can be produced at a fraction of the cost of rubber, it is said to offer a much higher percentage of profit.

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